

I Claim:

1. An apparatus for automatically covering and uncovering one or more containers as he container is deposited at a station so as to allow the container to allow individual containers to be deposited at a station either in an open or closed condition comprising:

a first carousel for holding one or more containers;

a second carousel for holding one or more covers for said containers, said first and second carousels sharing a common central axis; and

means for simultaneously rotating said first and second carousels in unison around their common central axis, while moving the carousels independently along their common central axis.

2. The apparatus of Claim 1, wherein the common central axis is vertical and the first carousel is positioned below the second carousel.

3. The apparatus of Claim 2, wherein the first and second carousels are positioned such that each container and its respective cover are in alignment.

4. The apparatus of Claim 3, wherein individual containers are automatically deposited on a station through movement of the first carousel along its central axis.

5. The apparatus of Claim 4, wherein whether a container is open or is closed by a cover is determined by the motion of the second carousel along the common axis of the first and second carousels.

6. The apparatus of Claim 1, wherein the first and second carousels are circular.
7. The apparatus of Claim 6, wherein the one or more containers are mounted in one or more openings positioned around the perimeter of the first carousel.
8. The apparatus of Claim 7, wherein the one or more coves are mounted in one or more openings positioned around the perimeter of the second carousel.
9. The apparatus of Claim 8, wherein the presence or absence of a container cover on a container is determined by the motion of the second carousel along the common axis of the first and second carousels.
 10. The apparatus of Claim 9, wherein said containers are crucibles and where said covers are crucible covers.
 11. An apparatus to automatically and simultaneously raise and lower a series of corresponding covers from a series of containers in accord with a predetermined procedure and to deposit any container from said series, covered with said corresponding cover or uncovered, on a station in accord with said predetermined procedure comprising:

a support structure comprising stationary means to permit vertical displacement of a supported body;

a vertically displaceable support body, said body comprising means to communicate with said stationary means to permit vertical displacement;

a first means to raise and lower and support said vertically displaceable support body, with said raising and lowering means supported by said support structure;

an upper means to support a series of said covers in a generally horizontal circular configuration;

a lower means to support a series of said containers in a generally horizontal circular configuration with said means disposed below said upper means;

axle means to support said upper and said lower support means along a common central vertical rotational axis, with said support means able to rotate about said axis, and with said axle supporting means passing through and supported by said vertically displaceable body;

means to rotate said lower support means about said common central vertical axis, with said means supported by said vertically displaceable body;

means to vertically align said upper and said lower supporting means so that each corresponding cover in said series is vertically aligned with a container to which said cover corresponds and with said means also

linking said upper and lower supporting means so that both said supporting means rotate synchronously about said common central vertical axis;

a second means to raise and lower said upper support means so that said series of containers can be uncovered or covered and with said second means to raise and lower connected to said vertically displaceable body.

12. The apparatus according to claim 11 wherein said upper support means comprises an upper carousel having a multiplicity of openings to seat said covers and with said multiplicity of openings to seat said covers forming a generally circular pattern and said lower support means comprises a lower carousel having a multiplicity of openings to seat said containers and with said multiplicity of openings to seat said containers forming a generally circular pattern.

13. The apparatus according to claim 12 wherein said lower carousel further comprises a center and said lower carousel has an opening about said center and wherein said upper carousel has a center and wherein said axle means to support said upper and said lower support means comprises a hollow shaft connected around said opening of said lower carousel, and with said shaft protruding downwards from said lower carousel and wherein said axle means to support said upper carousel comprises a rod, said rod having an end and a distal end, and with an end of said rod connected to said center of said upper carousel, with said rod protruding downwards and passing through said opening about said center of said lower carousel and through said hollow shaft and with said distal end connected by connecting means to said second means to raise and lower.

14. The apparatus according to claim 13 wherein said connecting means comprises a rotational coupling and said second means to raise and lower is a pneumatic cylinder.

15. The apparatus according to claim 14 wherein said means to rotate comprises a gear, with said hollow shaft passing through and connected to said gear, with said gear connected to a pulley and said pulley driven by a step motor.

16. The apparatus according to claim 15 wherein said lower carousel further comprises a face, with said face facing said upper carousel, and wherein said means to vertically align said upper and said lower supporting means comprises a pin connected to and protruding

perpendicularly upwards from said face of said lower carousel, and an aperture to receive said pin, with said upper carousel having said aperture, and with said pin and said aperture aligned so that with said pin in said aperture, each opening in said upper carousel is vertically aligned with an opening in said lower carousel, and with said pin of sufficient length to remain within said aperture when said upper carousel is moved upwards and wherein said pin received by said aperture links said lower to said upper carousel so that both carousels can rotate synchronously.

17. The apparatus according to claim 16 wherein said second means to raise and lower is a pneumatic cylinder.

18. The apparatus according to claim 17 wherein said hollow shaft further comprises bearings to support said rod and a retaining ring to prevent vertical movement of said hollow shaft within said vertically displaceable support body and said retaining ring further comprises means to signal a position to a sensor.

19. The apparatus according to claim 18 wherein said stationary means to permit vertical displacement of a supported body comprising said support structure comprises a stationary component of a slide joint, and said means to communicate with said stationary means comprising said support body comprises a slide joint component complementary to said stationary component.

20. The apparatus according to claim 19 wherein said covers are crucible covers, and said containers are crucibles, and wherein each crucible cover has an outer perimeter, and each said outer perimeter of each said cover has a ledge projecting therefrom, so that when each cover is seated on said upper carousel each cover ledge keeps each said cover in place, and wherein each crucible has an outer perimeter, and each said outer perimeter of each said crucible has a ledge projecting therefrom, so that when each said crucible is seated on said lower carousel each crucible ledge keeps each said crucible in place.

21. An apparatus to automatically and simultaneously raise and lower a series of corresponding covers from a series of crucibles containing samples, with said covers and said crucibles contained in a furnace, in accord with a predetermined procedure for proximate analysis of said samples, and to deposit any crucible from said series on a balance platform, contained within said furnace, for weight determination, with said any crucible covered with said corresponding cover or uncovered, comprising:

a support structure comprising stationary means to permit vertical displacement of a supported body;

a vertically displaceable support body, said body comprising means to communicate with said stationary means to permit vertical displacement;

a first means to raise and lower and support said vertically displaceable support body, with said raising and lowering means supported by said support structure;

an upper carousel to support said series of covers, with said upper carousel having a multiplicity of openings in which to seat said series of covers, and with said multiplicity of openings forming a generally circular pattern;

a lower carousel to support said series of crucibles, with said lower carousel having a multiplicity of openings in which to seat said series of crucibles, and with said multiplicity of openings forming a generally circular pattern and with said lower carousel disposed below said upper carousel;

axle means to support said upper and said lower carousel along a common central vertical rotational axis, with said carousels able to rotate about said axis, and with said axle supporting means passing through and supported by said vertically displaceable body;

Figure 1 consists of 12 histograms arranged in a single row, labeled x_1 through x_{12} from left to right. Each histogram shows the frequency of non-zero elements in the vector x_k . The x-axis for each histogram is labeled x_k and has tick marks at 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. The y-axis is labeled 'count' and has tick marks at 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. The distributions are roughly bell-shaped and centered around 5-6, with the peak count increasing from 10 for x_1 to 10 for x_{12} .

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25. The apparatus according to claim 24 wherein said lower carousel further comprises a face, with said face facing said upper carousel, and wherein said means to vertically align said upper and said lower supporting means comprises a pin connected to and protruding perpendicularly upwards from said face of said lower carousel, and an aperture to receive said pin, with said upper carousel having said aperture, and with said pin and said aperture aligned so that with said pin in said aperture, each opening in said upper carousel is vertically aligned with an opening in said lower carousel, and with said pin of sufficient length to remain within said aperture when said upper carousel is moved upwards and wherein said pin received by said aperture links said lower to said upper carousel so that both carousels can rotate synchronously.

26. The apparatus according to claim 25 wherein said second means to raise and lower is a pneumatic cylinder.

27. The apparatus according to claim 26 wherein said hollow shaft further comprises bearings to support said rod and a retaining ring to prevent vertical movement of said hollow shaft within said vertically displaceable support body and said retaining ring further comprises means to signal a position to a sensor.

28. The apparatus according to claim 27 wherein said stationary means to permit vertical displacement of a supported body comprising said support structure comprises a stationary component of a slide joint, and said means to communicate with said stationary means comprising said support body comprises a slide joint component complementary to said stationary component.

29. The apparatus according to claim 28 wherein each crucible cover comprises an outer perimeter, and each said outer perimeter has a ledge projecting therefrom, so that when each cover is seated on said upper carousel, said ledge comprising said covers keeps each said

30. A crucible and a corresponding crucible cover for use in an automatic proximate analyzer, said crucible comprising an outer perimeter and with said crucible having a ledge projecting from and encircling said outer perimeter, and said crucible cover comprising an outer perimeter and with said crucible cover having a ledge projecting from and encircling said outer perimeter.

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